PAPER OF THE MONTH 10/2023

TRR 295 ReTune

Feasibility of local field potential-guided programming for deep brain stimulation in Parkinson's disease: A comparison with clinical and neuro-imaging guided approaches in a randomized, controlled pilot trial.

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This study has investigated the potential of using beta oscillations as a biomarker for programming deep brain stimulation (DBS) in patients with Parkinson's disease (PD), with the aim of improving clinical outcomes. This trial was specifically designed to assess the advantages of beta-guided DBS programming compared to the standard clinically and image-guided approaches. The study was conducted with eight PD patients who had undergone subthalamic nucleus DBS (STN-DBS). It was structured as a randomized, blinded, three-arm crossover trial, focusing on evaluating clinical efficacy and programming time three months post-DBS surgery. Each patient was subjected to three programming paradigms: clinically-guided, image-guided, and beta-guided.

The main findings revealed no significant difference in symptom control across all three programming methods after 30 minutes of stimulation. Motor score improvements were comparable with 57.66% for clinically-guided, 57.21% for image-guided, and 65.18% for beta-guided programming. Patients maintained their assigned DBS program at the three-month follow-up and reported satisfaction with the treatment, albeit minor amplitude adjustments were required for enhanced symptom control in two cases.

Notably, a significant reduction in total programming time (TPF) was observed for image- and beta-guided programming when compared to clinically-guided programming. The average duration was 60 minutes for clinically-guided, 27 minutes for image-guided, and only 19 minutes for beta-guided programming, marking a substantial decrease in time without compromising clinical outcomes.

Furthermore, no significant differences were found in stimulation settings or power consumption across the three methods, indicating that the improved efficiency of the beta-guided approach did not result in increased energy expenditure.

The study also explored the possibility of titrating stimulation amplitude based on the suppression of pathological beta bands, which was achievable in five out of the eight patients. Beta titration resulted in improved symptom control in four patients, whereas one experienced a decrease in symptom control.

In summary, beta-guided programming of STN-DBS for PD presents as a time-efficient method without sacrificing clinical efficacy. It holds promise for being integrated into routine clinical practice due to its capability of reducing programming duration and its convenience of being readily available within clinical DBS programmers. The findings support further research and consideration for adopting beta-guided programming as a standard practice for optimizing DBS settings in PD patients.

Dr. Tobias Binder

Tobias Binder studied medicine in Würzburg and Tübingen. He did his doctorate on fMRI characteristics of the prodromal phase of Parkinson's disease and is a resident physician at the Universitätsklinikum Würzburg. His scientific focus is on movement disorders and deep brain stimulation in clinical practice.

Dr. Florian Lange

Florian Lange is a neurologist at the Julius-Maximilians-Universität and Hospital Würzburg and an advanced clinician scientist in the visualDBSlab. His primary research focus is the direct implementation of state-of-the-art imaging or electrophysiological methods into the daily patient care of patients with DBS. He has demonstrated the clinical applicability of sweet spot programming, LFP-based DBS parameter selection, and AI-based programming of DBS in different clinical studies.

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